

REMARKS

Summary

Amended independent Claims 1 and 12 recite at least one feature not disclosed or suggested by the patents to Nishio and Hayashi, et al. Therefore, are the outstanding rejections of these claims over this art still proper?

Status of the claims

Claims 1, 4, and 12 have been amended. Claims 13-34 have been canceled without prejudice. Claims 35-40 have been added. Accordingly, Claims 1-12 and 35-40 are pending. Claims 1, 12, and 35-40 are independent.

Requested action

Applicant respectfully requests the Examiner to reconsider and withdraw the outstanding objections and rejections in view of the foregoing amendments and the following remarks.

Examiner's Request

The Examiner requests a copy of Japanese Patent No. 06-260088, discussed at page 2 of the application. In response, Applicant has reviewed the application again and notes that the application contains an inadvertent typographical error in the number identifying this patent. Applicant has amended the specification to provide the correct number and is submitting an Information Disclosure Statement with the required fee and the patent and its U.S. equivalent.

Specification objection

The disclosure has been objected to because of the use of the variable " ϕL_i " is used inconsistently in different parts of the application. For example, at page 15 in criterion (A-

2), this term is used to identify the total power of the i th lens unit, while at page 21, line 23 it is identified as being solely the total diffractive power of the i th lens unit, in Claim 4 it refers to the collective power of the first, second and fourth lens units, and in Claim 27 this variable refers to the collective power of the first, second, third, and fourth lens units.

In response, while not conceding the propriety of the objection, the specification and Claim 4 have been amended to address the points raised by the Examiner. Applicant submits that the specification now even more clearly satisfies 35 U.S.C. § 112, second paragraph.

Additional specification amendment

Applicant has also amended the specification to delete an inadvertent typographical error in numerical examples 2 and 3 by deleting “*D” before r_2 because it is clear from Figures 4 and 7 that only r_9 is the diffractive optical element in both examples.

Formal rejections

Claim 34 is rejected under 35 U.S.C. § 112, first paragraph, because the specification allegedly does not provide an example of diffractive optical element in the second or third lens group, as recited in Claim 34. In response, while not conceding the propriety of the rejection, Claim 34 has been canceled without prejudice.

Claims 4, 16, 19, 20, and 27 are rejected under 35 U.S.C. § 112, second paragraph. The Examiner states that the recitation of the “entire i th lens unit” in these claims is incorrect because it should refer to all the optical elements, both refractive and diffractive, in the i th lens unit. The Examiner also objects to Claim 4 because the first, second and fourth lens units are associated with values of $i = 1, 2, 3$, and 4. In response, while not conceding the propriety of the rejection, Claim 4 has been amended to address the points raised by the Examiner and Claims 13-34 have been canceled without prejudice.

Applicant submits that as amended, Claim 4 now even more clearly satisfies 35 U.S.C. § 112, second paragraph.

Substantive rejections

Claims 1-5, 7, 8, 10-17, 19, 20, 22-28, 30, 31, 33, and 34 are rejected under 35 U.S.C. § 102(b) as being anticipated by Nishio (U.S. Patent No. 5,978,153). Claims 1, 4-7, 9, 11-13, 16-19, 21, 23, 24, 27-30, 32, and 34 are rejected under 35 U.S.C. § 102(b) as being anticipated by Hayashi, et al. (U.S. Patent No. 6,002,519). ‘

Response to substantive rejections

In response, while not conceding the propriety of the rejections, independent Claims 1 and 12 have been amended. Applicant submits that as amended, these claims are allowable for the following reasons.

Independent Claim 1 relates to a zoom lens, comprising in sequence from an object side to an image side a first lens unit having a positive optical power, a second lens unit having a negative optical power, a third lens unit having a positive optical power, and a fourth lens unit having a negative optical power. At least one of the first, second, third, and fourth lens units has at least one diffractive optical surface. The shape of the surface closest to the image side in said fourth lens unit is convex to the image side.

Claim 1 has been amended to recite that the first, second, third, and fourth lens units move to the object side along an optical axis in zooming from the wide angle end to the telephoto end. Claim 1 has also been amended to recite that the lens units comprising the zoom lens are only the first, second, third, and fourth lens units.

In contrast, the patents to Nishio and Hayashi, et al. are not understood to disclose or suggest that first, second, third, and fourth lens units move to the object side along an optical axis in zooming from the wide angle end to the telephoto end, or that the lens units comprising the zoom lens are only the first, second, third, and fourth lens units, as recited

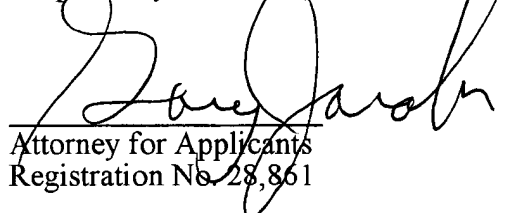
by amended Claim 1. For this reason, amended Claim 1 is allowable over this art. And since amended Claim 12 and independent Claims 35-40 recite the same features, they are allowable for the same reasons.

The dependent claims are allowable for the reasons given with respect to the independent claims and because they recite features which are patentable in their own right. Individual consideration of the dependent claims is respectfully solicited.

In view of the above amendments and remarks, the claims are now in allowable form. Therefore, early passage to issue is respectfully solicited.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



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MARKED-UP AMENDED SPECIFICATION

Please substitute the following paragraph for the paragraph starting at page 2 line 13 and ending at line 19. A marked-up copy of this paragraph, showing the changes made thereto is attached.

—Japanese Patent Laid-Open No. [06-260088] 06-250088, for example, proposes a zoom lens composed of four lens units which sequentially have positive, negative (or positive), positive, and negative optical powers from an object as a zoom lens composed of four lens units to simultaneously realize both a reduction in size of an optical system and the improvement of optical performance.--

Please substitute the following paragraph for the paragraph starting at page 21, line 12 and ending at line 25. A marked-up copy of this paragraph, showing the changes made thereto is attached.

—In the numerical examples, reference symbol r_i denotes a radius of curvature of an i -th surface in sequence from an object, reference symbol d_i denotes an interval between an i -th surface and an $(i + 1)$ -th surface in sequence from the object, reference numerals n_i and v_i denote a refractive index and an Abbe number of an i -th optical material in sequence from the object, respectively, f denotes the focal length, F_{no} denotes the F number, B , C , and D denote aspherical surface coefficient, $C1$ - $C4$ denote phase coefficients, ϕD_i denotes the optical power obtained by the diffractive action of the diffractive optical surface of an i -th lens unit, and ϕL_i denotes the overall [diffractive] optical power of the i -th lens unit including the diffractive optical surface [of the i -th lens unit].--

Please substitute the following paragraph for the paragraph starting and ending at page 26, line 4. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--[*D] $r_2 = -78.108$ $d_2 = 0.15$ --.

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Please substitute the following paragraph for the paragraph starting and ending at page 28, line 4. A marked-up copy of this paragraph, showing the changes made thereto is attached.

--[*D] r2= 128.901 d2=0.15 --.



MARKED-UP AMENDED CLAIMS

1. (Amended) A zoom lens, comprising in sequence from an object side to an image side:

- a first lens unit having a positive optical power;
- a second lens unit having a negative optical power;
- a third lens unit having a positive optical power; and
- a fourth lens unit having a negative optical power,

wherein [the zoom lens executes zooming by moving all] said first, second, third, and fourth lens units move to the object side along an optical axis in zooming from the wide angle end to the telephoto end, [along an optical axis, and]

wherein at least one of said first, second, third, and fourth lens units has at least one diffractive optical surface,

wherein the lens units comprising the zoom lens are only said first, second, third, and fourth lens units, and

wherein the shape of the surface closest to the image side in said fourth lens unit is convex to the image side.

4. (Amended) A zoom lens according to claim 1, wherein said first, second, third, and fourth lens units are individually denoted as the i-th lens unit, where i equals 1, 2, 3, or 4, [and said first, second, third, and fourth lens units are collectively denoted as the entire i-th lens unit,] wherein when the optical power obtained by the diffractive action of the diffractive optical surface of said i-th lens unit is denoted by ϕDi , and the optical power of the [entire] i-th lens unit is denoted by ϕLi , the condition $\phi Di / \phi Li > 0$ is satisfied.

12. (Amended) Optical equipment, comprising:
an optical-equipment element; and

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a zoom lens, connected to said optical-equipment element, said zoom lens comprising in sequence from an object side to an image side:

- a first lens unit having a positive optical power;
- a second lens unit having a negative optical power;
- a third lens unit having a positive optical power; and
- a fourth lens unit having a negative optical power,

wherein [the zoom lens executes zooming by moving all of said first, second, third, and fourth lens units along an optical axis, and] said first, second, third, and fourth lens units move to the object side along an optical axis in zooming from the wide angle end to the telephoto end,

wherein at least one of said first, second, third, and fourth lens units has at least one diffractive optical surface,

wherein the lens units comprising the zoom lens are only said first, second, third, and fourth lens unit, and

wherein the shape of the surface closest to the image side in said fourth lens unit is convex to the image side.